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10/006,334

12/03/2001

Kamesh V. Gadepally

NSC1-G0610 [P04402
P01]

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09/17/2003

Alfred A. Equitz
GIRARD & EQUITZ LLP
Suite 1110
400 Montgomery Street
San Francisco, CA 94104

EXAMINER

HOANG, QUOC DINH

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 09/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/006,334

Applicant(s)

GADEPALLY, KAMESH V.

Examiner

Quoc D Hoang

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Notice to Applicant

1. Response filed on 6/30/2003 has been entered and made of record as Paper No. 13. Claims 1-13 are pending in the application in Paper No. 13 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu., (US Patent 6,087,227) in view of Goto et al., (US Pat 6,197,646).

Regarding claims 1, 8 and 13, Hsu., Figs. 1-3, and related text on col. 1-7 which discloses a method for forming cobalt salicide regions and cobalt salicide exclusion regions during the manufacturing of an integrated circuit (IC), the method comprising the steps of (a) providing an IC structure including a plurality of MOS transistor structures, the plurality of MOS transistor structures having exposed silicon surfaces (col.6, lines 5-67 and Fig. 3A); (b) depositing a cobalt layer 430 on the IC structure in a controlled manner (col.6, lines 25-30 and Fig. 3B); (d) forming a photoresist masking layer 430 on those MOS transistor structures where cobalt salicide regions are to be formed (col.6, lines 30-35 and Fig. 3C); (e) removing the cobalt layer 430 from those MOS transistor structures where cobalt salicide exclusion regions are to be formed (col.6, lines 37-43) and Fig. 3D); (f) after step (e), stripping the photoresist masking

layer 432 (col.6, lines 43-65 and Fig. 3 E); and (g) after step (f), reacting cobalt in the cobalt layer 430 with silicon 410 in the exposed silicon surfaces to form cobalt silicide regions 450 (col.7, lines 1-10 and Fig. 3F).

Hsu., does not disclose depositing a capping layer on the cobalt layer. Also, Hsu., does not disclose wherein step (b) includes the step of controlling at least one metal deposition parameter such that the cobalt layer has at least one predetermined property, and the at least one predetermined property is such that at least one of the cobalt silicide regions formed in step (g) has at least one predetermined attribute.

Goto et al., discloses in figure 6A and on columns 10-11 a step (c) depositing a capping layer on the cobalt layer (col. 11, lines 9-15), and wherein step (b) includes the step of controlling at least one metal deposition parameter such that the cobalt layer has at least one predetermined property and the at least one predetermined property is such that at least one of the cobalt silicide regions formed in step (g) has at least one predetermined attribute (col. 10, lines 50-67 and Fig. 6A).

Hsu., and Goto et al., are combinable because they are from the same field of endeavor. At the time of the invention it would have been obvious to a person of ordinary skill in the art to control the refractory metal thickness formed on the silicon gate electrode. The motivation for doing so is to control the sheet resistance of the metal silicate layer. Therefore, it would have been obvious to combine Hsu., with Goto et al., to obtain the invention of claims 1, 8 and 13.

Regarding claims 2 and 9, Goto et al., discloses one predetermined attribute of said at least one of the metal salicide regions is a sheet resistance (col. 10, lines 50-67 and Fig. 6A).

Regarding claims 3 and 10, Goto et al., discloses one predetermined attribute of said at least one of the cobalt salicide regions is a conductivity (col. 10, lines 50-67 and Fig. 6A).

Regarding claims 4 and 11, Goto et al., discloses at least one predetermined property of the cobalt layer is a thickness of said cobalt layer (col. 10, lines 50-67 and Fig. 6A).

Regarding claims 5 and 12, Goto et al., discloses the removal during step (e) of the cobalt layer from those MOS transistor structures where cobalt salicide exclusion regions are to be formed, is performed in a manner significantly limiting cobalt salicide crawl over and under the cobalt salicide regions formed during step (g) (col. 10, lines 50-67 and Fig. 6A).

Regarding claim 6, Goto et al., discloses the metal layer deposited in step (b) comprises metal selected from the group consisting of cobalt, titanium, tantalum, nickel and molybdenum (col. 10, lines 50-67 and Fig. 6A).

Regarding claim 7, Goto et al., discloses the metal layer deposited in step (b) has a thickness in the range of 150 to 500 angstroms (col. 11, lines 1-5 and Fig. 6A).

Response to Arguments

4. Applicant's arguments filed on 6/30/2002 have been fully considered but they are not persuasive for at least the following reasons.

Applicant's argument concerns that cited reference Goto's method do not teach depositing metal with a predetermined thickness to achieve a source limited silicidation reaction. The examiner disagrees. Clearly in Figure 6A and col. 10, lines 50-67, the refractory metal of a predetermined thickness is deposited by sputtering in order to control the sheet resistance of the salicide layer. Though Goto's do not expressly disclose reducing salicide crawl, clearly in Figure 7A, no salicide crawl is formed beyond the portions of the MOS transistor structure where metal salicide regions are to be formed.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quoc Hoang whose telephone number is (703) 306-

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5795. The examiner can normally be reached on Monday-Friday from 8.00 AM to 5.00 PM.

If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (703) 308-4910. The fax phone numbers of the organization where this application or proceeding is assigned are (703) 746-4016 for regular communications and (703) 746-4016 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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Quoc Hoang
Patent examiner/AU 2818.



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PRIMARY EXAMINER